



Tennessee Valley Authority, Sequoyah Nuclear Plant, P.O. Box 2000, Soddy Daisy, Tennessee 37384

February 7, 2020

10 CFR 50.73

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Sequoyah Nuclear Plant, Unit 2
Renewed Facility Operating License No. DPR-79
NRC Docket No. 50-328

Subject: Licensee Event Report 50-328/2019-002-00, Loss of Heater Drain Tank Flow Causes Turbine Runback and Manual Reactor Trip

The enclosed licensee event report provides details concerning a manual reactor trip and automatic safety system actuation. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A), as any event or condition that resulted in actuation of the Reactor Protection system and Auxiliary Feed Water system.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact Mr. Jeffrey Sowa, Site Licensing Manager, at (423) 843-8129.

Respectfully,

A handwritten signature in black ink, appearing to be "MR", followed by a horizontal line.

Matthew Rasmussen
Site Vice President
Sequoyah Nuclear Plant

Enclosure: Licensee Event Report 50-328/2019-002-00

cc: NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Sequoyah Nuclear Plant



LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. Facility Name Sequoyah Nuclear Plant, Unit 2	2. Docket Number 05000328	3. Page 1 OF 6
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4. Title Loss of Heater Drain Tank Flow Causes Turbine Runback and Manual Reactor Trip

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
12	12	2019	2019	002	00	02	07	2020	NA	05000
									Facility Name	Docket Number
									NA	05000

9. Operating Mode 1	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
10. Power Level 100	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(iii)
<input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> Other (Specify in Abstract below or in NRC Form 366A)				

12. Licensee Contact for this LER	
Licensee Contact Andrew McNeil	Telephone Number (Include Area Code) 423-843-8098

13. Complete One Line for each Component Failure Described in this Report									
Cause	System	Component	Manufacturer	Reportable To ICES	Cause	System	Component	Manufacturer	Reportable To ICES
X	SN	LCV	M430	Y					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No				

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On December 12, 2019, at 0433 Eastern Standard Time (EST), Sequoyah Nuclear Plant Unit 2 was manually tripped as a result of a secondary system level control valve positioner failure. The failure of the valve led to reduced secondary system Heater Drain Tank flow and a unit down power. During the down power, manual reactor trip criteria was reached. All safety-related equipment operated as designed, all controls rods fully inserted as required, and the Auxiliary Feedwater system automatically initiated as expected.

The failed positioner was replaced with a newer model. Investigation revealed that a fine adjust screw had loosened, preventing the valve positioner from correctly responding to control signals. An extent-of-condition was performed to identify other susceptible components, and actions have been taken to replace a necessary component with a newer model.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Sequoyah Nuclear Plant, Unit 2	05000-328	YEAR	SEQUENTIAL NUMBER	REV NO.
		2019	- 002	- 00

NARRATIVE**I. Plant Operating Conditions Before the Event**

At the time of the event, Sequoyah Nuclear Plant (SQN) Unit 2 was operating at 100-percent rated thermal power.

II. Description of Event**A. Event Summary:**

On December 12, 2019, at 0429 EST, SQN Unit 2 Control Room received an annunciator alarm "No. 3 HTR DR TK BYPASS TO COND C OPEN". Level Control Valve 2-LCV-6-105A [EIS: LCV] failed in a full OPEN position while controlling #3 Heater Drain Tank (HDT) [EIS: TK] level, which resulted in the HDT contents discharging directly to the main condenser and resulted in a lowering tank level. The lowering #3 HDT level triggered protective trips for the associated HDT pumps [EIS: P] 2A, 2B, and 2C. 2C HDT Pump tripped first at 0432, triggering a designed secondary system runback, followed by the trip of 2B and 2A HDT Pumps. Main Control Room (MCR) Operators entered the appropriate Abnormal Operating Procedure (AOP) for the loss of HDT flow in parallel with monitoring the runback and dispatching field operators to investigate. Operators manually tripped the reactor at 0433 EST in accordance with (IAW) the AOP guidance after the third #3 HDT pump automatically tripped on low HDT level, resulting in no operating #3 HDT pumps.

Following the reactor trip, all safety related equipment operated as designed. No complications were experienced. The Auxiliary Feedwater System (AFW) [EIS: BA] automatically initiated post-trip as designed and restored steam generator [EIS: SG] water levels.

The Unit 2 reactor trip is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A), as an event that resulted in an actuation of the Reactor Protection System (RPS) [EIS: JC] and the Auxiliary Feedwater System.

B. Status of structures, components, or systems that were inoperable at the start of the event and contributed to the event:

No inoperable structures, components, or systems (SSCs) contributed to this event.

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C. Dates and approximate times of occurrences:

Date/Time (EST)	Description
December 12, 2019 at 0429	2-LCV-6-105A failed in the FULL OPEN position, discharging #3 HDT contents into the main condenser.
December 12, 2019 at 0429	#3 HDT Low Level alarm was received in MCR.
December 12, 2019 at 0432	2C HDT Pump tripped, followed by 2B HDT Pump trip. A Main Turbine Runback automatically initiated. Operators entered AOP-S.04 (Condensate or Heater Drains Malfunction).
December 12, 2019 at 0433	2A HDT Pump tripped, leaving no #3 HDT pumps operating. The Unit Supervisor directed a manual reactor trip IAW Abnormal Operating Procedure guidance, followed by entry into procedure E-0 (Reactor Trip).
December 12, 2019 at 0433	The AFW system automatically initiated as designed in response to the reactor trip.
December 12, 2019 at 0443	Operators transitioned from E-0 (Reactor Trip) to ES-0.1 (Reactor Trip Response) and Mode 3 operations.

D. Manufacturer and model number of each component that failed during the event:

Moore Model 750P Pneumatic Valve Positioner.

E. Other systems or secondary functions affected:

There were no other systems or secondary functions affected by this event.

F. Method of discovery of each component or system failure or procedural error:

Main Control Room alarms and annunciators provided indication to the operators.

G. Failure mode, mechanism, and effect of each failed component:

The affected level control valve failed in the open position due to a failed valve positioner. A locking nut backed off an adjustment screw on the positioner, resulting in a lack of proper spring tension on the positioner pilot assembly. When the valve received a demand bias to



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modulate for tank level control, the valve traveled to the full open position due to a lack of balanced spring tension.

H. Operator actions:

The MCR Operators responded to loss of HDT Pump flow, runback, and reactor trip as required. They promptly identified plant conditions and took appropriate actions.

I. Automatically and manually initiated safety system responses:

The RPS manual actuation, and automatic AFW System initiation, responded as designed.

III. Cause of the Event

A. Cause of each component or system failure or personnel error:

Although the exact cause of the valve positioner failure is unknown, possible causes of the fine zero lock nut backing off the screw include wear of the threads on the lock nut or screw, vibration, poor design of locking mechanism, and lack of vendor guidance for torque values.

B. Cause(s) and circumstances for each human performance related root cause:

There was no identified human performance related root cause.

IV. Analysis of the Event:

The SQN Heater Drain system [EHS: SN] is a secondary system designed to remove and dispose of all drainage from the moisture separators, reheaters, feedwater heaters, main feed pump turbine condensers and gland steam condensers during all modes of unit operation by returning the condensed water back to the Condensate-Feedwater System.

Condensed water from high pressure secondary components flow into the #3 HDT, and that water is then pumped forward into the condensate cycle by the #3 HDT Pumps, consisting of three pumps in parallel. Level in the #3 HDT is maintained within the proper range by modulating level control valves at the discharge of the #3 HDT Pumps. High level in the #3 HDT initiates opening of modulating bypass-to-condenser valves. Low level in the HDT results in a trip of all operating #3 HDT Pumps. If the discharge flowrate of the #3 HDT Pumps is reduced below a predefined setpoint of 5500 gallons-per-minute with unit power greater than approximately 82 percent, a main turbine runback is initiated in order to ensure sufficient condensate-feedwater flow.

The plant safety system responses during and after the reactor trip were bounded by the responses described in the Updated Final Safety Analysis Report (UFSAR) for a total loss of normal feedwater.

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Therefore, this event did not adversely affect the health and safety of plant personnel or the general public.

V. Assessment of Safety Consequences

There were no actual safety consequences as a result of this event.

- A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event:

The event occurred with the plant at power with no other coincident transients or events. Had a total loss of main feed water occurred, decay heat removal capability existed in the form of AFW pumps and steam reliefs to maintain sufficient heat removal as described in the UFSAR.

- B. For events that occurred when the reactor was shut down, availability of systems or components needed to shut down the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident:

The event did not occur when the reactor was shut down.

- C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from discovery of the failure until the train was returned to service:

This event did not render a safety system inoperable.

VI. Corrective Actions

The reactor trip event was entered into the Tennessee Valley Authority Corrective Action Program (CAP) under Condition Report #1572651.

- A. Immediate Corrective Actions:

The affected positioner was replaced with a newer model. The newer model provides equivalent operation but includes a more robust mechanism for adjusting calibration, which includes a cam locking nut and a cam locking screw to prevent the fine zero lock nut from inadvertent movement.

- B. Corrective Actions to Prevent Recurrence or to reduce probability of similar events occurring in the future:

An extent of condition evaluation was performed to determine if any similar positioners were



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installed in either Unit 1 or Unit 2. As a result corrective actions have been taken to replace one other positioner on Unit 1. The positioner classifications have been upgraded to a critical component. Actions have been implemented to ensure preventative maintenance items are generated as needed to align with the fleet maintenance strategy.

VII. Previous Similar Events at the Same Site:

On October 24, 2019, the #3 HDT condenser bypass valve (2-LCV-006-105A) spuriously throttled open with SQN Unit 2 at power. Operations identified the condition and lowered power to 95 percent. While stabilizing power for investigation, further spurious movement of the level control valve reduced forward flow of the #3 HDT Pump which initiated the secondary runback. The runback was terminated and plant power was stabilized at 74 percent RTP. Investigation revealed that the positioner for the level control valve was faulty. The positioner was replaced, and the issue documented in TVA CAP Condition Report #1559882.

VIII. Additional Information

There is no additional information.

IX. Commitments:

There are no commitments.